

REMARKS

Claims 1-15 were presented for examination and were pending in this application. In the latest Office Action, claims 1-15 were rejected, and claims 7-14 were objected to. With this amendment, claims 1 and 4-15 are amended, claim 3 is canceled, and new claims 16-21 are added. On the basis of the following remarks, consideration of this application and allowance of all pending claims are requested.

Claims 1-15 were rejected under 35 U.S.C. § 112, second paragraph, as indefinite. It is believed that the claim amendments made herein address and/or render moot these rejections.

In addition, claims 1 and 15 were rejected as made obvious by U.S. Patent No. 6,062,931 to Chuang et al. in view of U.S. Patent No. 6,331,209 to Jang et al., and claims 2-6 were rejected as made obvious by Chuang in view of Jang and in further view of International Publication No. WO 01/94260 A1 to Resasco et al. Claims 1-4 and 15 were rejected as made obvious by Resasco in view of Jang. Because none of the references cited, alone or in combination, disclose or suggest the claimed step of soaking the granularized catalyst layer in a soaking gas before growing the plurality of carbon nanotubes, Applicants respectfully assert that the claims as currently amended are patentable over the cited art.

The claims recite a method for forming carbon nanotubes for an electron-emitting device, generally comprising granularizing a catalyst layer, soaking the granularized catalyst layer in a soaking gas, and then growing a plurality of carbon nanotubes by exposing the catalyst layer to a plasma source gas. Amended claim 1, for example, recites:

1. *A method for forming carbon nanotubes for an electron-emitting device, comprising:
granularizing a catalyst layer to generate nano-sized granules for growing a plurality of carbon nanotubes;
soaking the granularized catalyst layer in a soaking gas before growing the plurality of carbon nanotubes to enhance diffusion properties of the granularized catalyst layer; and
growing the plurality of carbon nanotubes by exposing the catalyst layer to a plasma source gas.*

As the specification explains, soaking the granularized catalyst layer in the soaking gas before growing the carbon enhances the diffusion properties of the granularized catalyst layer.

Beneficially, this results in a more uniform and repeatable growth of the carbon nanotubes, producing nanotubes that have more uniform physical and electrical characteristics.

(Specification, p. 12-13, 16.) This claimed pre-growth soaking step is not disclosed or suggested anywhere in the cited references.

In the rejections for which Chuang was the primary reference, it was asserted in the Office Action that Chuang discloses the claimed soaking step. (The other references, Jang and Resasco, were used for other claim limitations and not the soaking step.) However, the Office Action failed to point out any place in Chuang that discloses or suggests the claimed soaking step. In fact, Chuang is completely silent with respect to anything like the claimed soaking step. Chuang generally discloses techniques for growing carbon nanotubes using a catalyst, and in particular Chuang is focused on depositing a sacrificial layer as a mask to deposit a catalyst layer with a smaller footprint over the emitter electrode. But Chuang does not disclose soaking a granularized catalyst layer in a soaking gas before growing the carbon nanotubes. Rather, Chuang teaches simply granularizing (or agglomerating) the catalyst layer and then growing the carbon nanotubes. (Chuang, col. 4, lines 23-32.) There is no mention here of soaking the granularized catalyst layer in a soaking gas.

Accordingly, because the rejections based on Chuang as the primary reference are premised on the incorrect assertion that Chuang discloses the claimed soaking step, these rejections should be withdrawn.

In the rejection for which Resasco was the primary reference, it was asserted that Resasco discloses the claimed soaking step. (The other reference, Jang, was used for other claim limitations and not the soaking step.) Specifically, the Office Action cited Resasco's specification at p. 24, lines 15-18, which describes a processing step in which a "reducing gas" is exposed to "catalytic particles" in a reaction cell. But this passage in Resasco does not disclose the claimed step of soaking the granularized catalyst layer in a soaking gas. Specifically, Resasco's reducing of catalytic particles is not the claimed soaking of a granularized catalyst layer. As Resasco explains, at p. 8, the reducing gas reduces the catalyst within the catalytic particles to prepare it for catalysis. Resasco is not here disclosing the claimed soaking process, which introduces to a granularized catalyst layer a soaking gas to enhance the diffusion properties of the granularized catalyst layer before growing the carbon nanotubes. Resasco's reducing and the claimed soaking are two different steps that have different results and are performed in two entirely different contexts.

Moreover, Resasco is directed to a completely different application for carbon nanotubes. Resasco describes a reaction cell for continuous catalytic production of carbon nanotubes. This process simply would not be appropriate for growing carbon nanotubes suitable for an electron-emitting device. Whereas Resasco is concerned with growing single-walled carbon nanotubes using "catalytically impregnated pellets" in a reaction cell, the claimed invention involves growing carbon nanotubes on a catalyst layer to produce uniform carbon nanotubes that have mechanical and electrical characteristics suitable for an electron-emitting device. Resasco's

technique would not be suitable for an electron-emitting device because Resasco's reaction chamber does not produce highly uniform, straight carbon nanotubes grown from a suitable cathode structure. Furthermore, Resasco does not teach the use of a catalyst layer that is granularized and then used to grow carbon nanotubes. Rather, Resasco discloses "catalytically impregnated pellets," which comprise a solid support material impregnated with a metallic catalyst, calcined, and processed in a pellet form. Resasco's catalytically impregnated pellets are not a granularized catalyst layer. Because Resasco does not have a granularized catalyst layer, Resasco cannot disclose soaking a granularized catalyst layer in a soaking gas.

Based on at least these differences, the rejection that uses Resasco as the primary reference is similarly premised on the incorrect assertion that Resasco discloses the claimed soaking step, and this rejection should also be withdrawn.

Applicants note with appreciation that the examiner has indicated that original claim 7 recites subject matter that would be allowable if the objections and indefiniteness rejections were addressed. Specifically, the examiner has indicated that a soaking gas that comprises C_2H_2 is patentable over the cited references. Applicants have not rewritten claim 7 in independent form because it is believed that all of the claims, as amended herein, are patentable over the cited references.

Lastly, the specification has been amended to provide the serial number information for the parent application of which the present application is a continuation-in-part. An updated filing receipt is therefore requested.

Based on the foregoing, the application is in condition for allowance of all claims, and a Notice of Allowance is respectfully requested. If the examiner believes for any reason direct

contact would help advance the prosecution of this case to allowance, the examiner is encouraged to telephone the undersigned at the number given below.

Respectfully submitted,
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